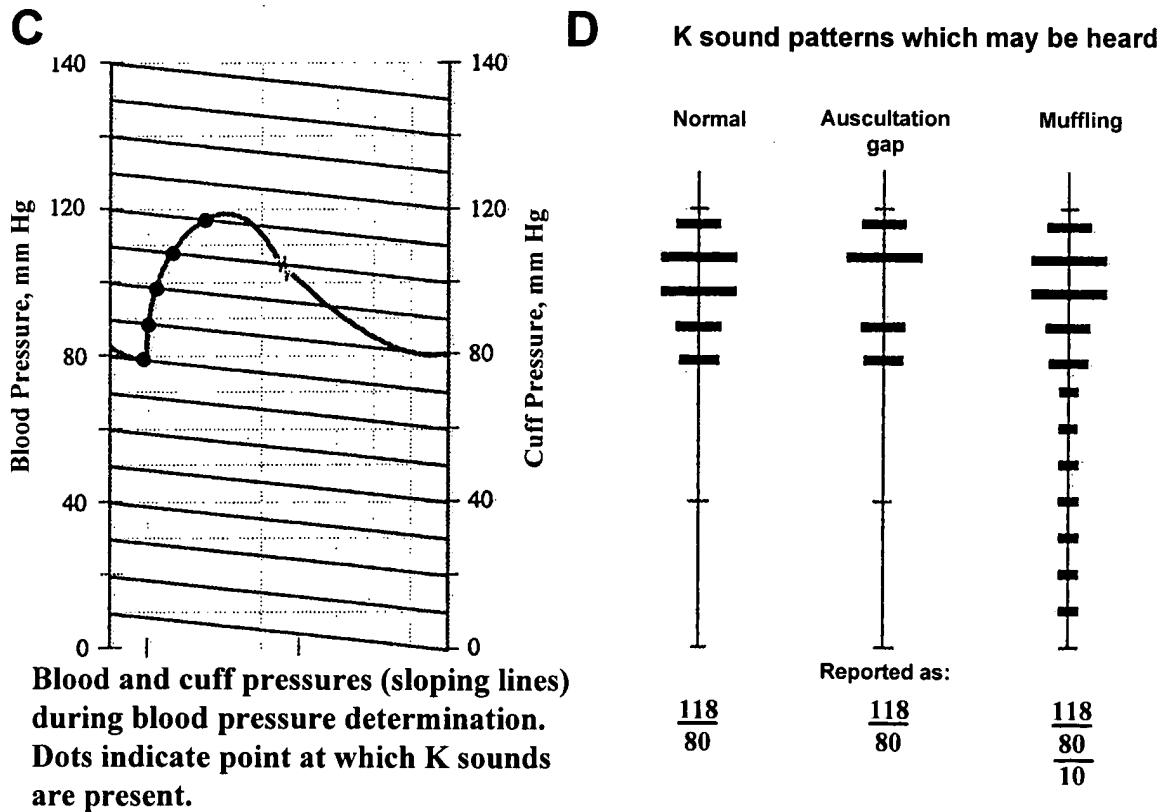
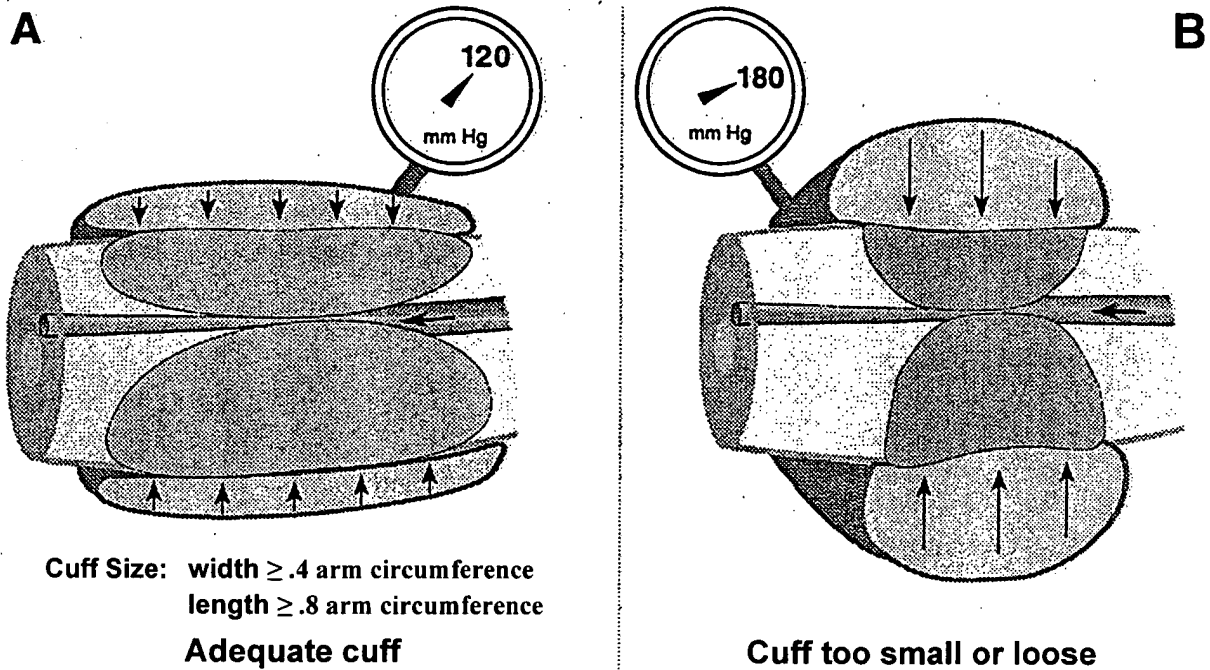
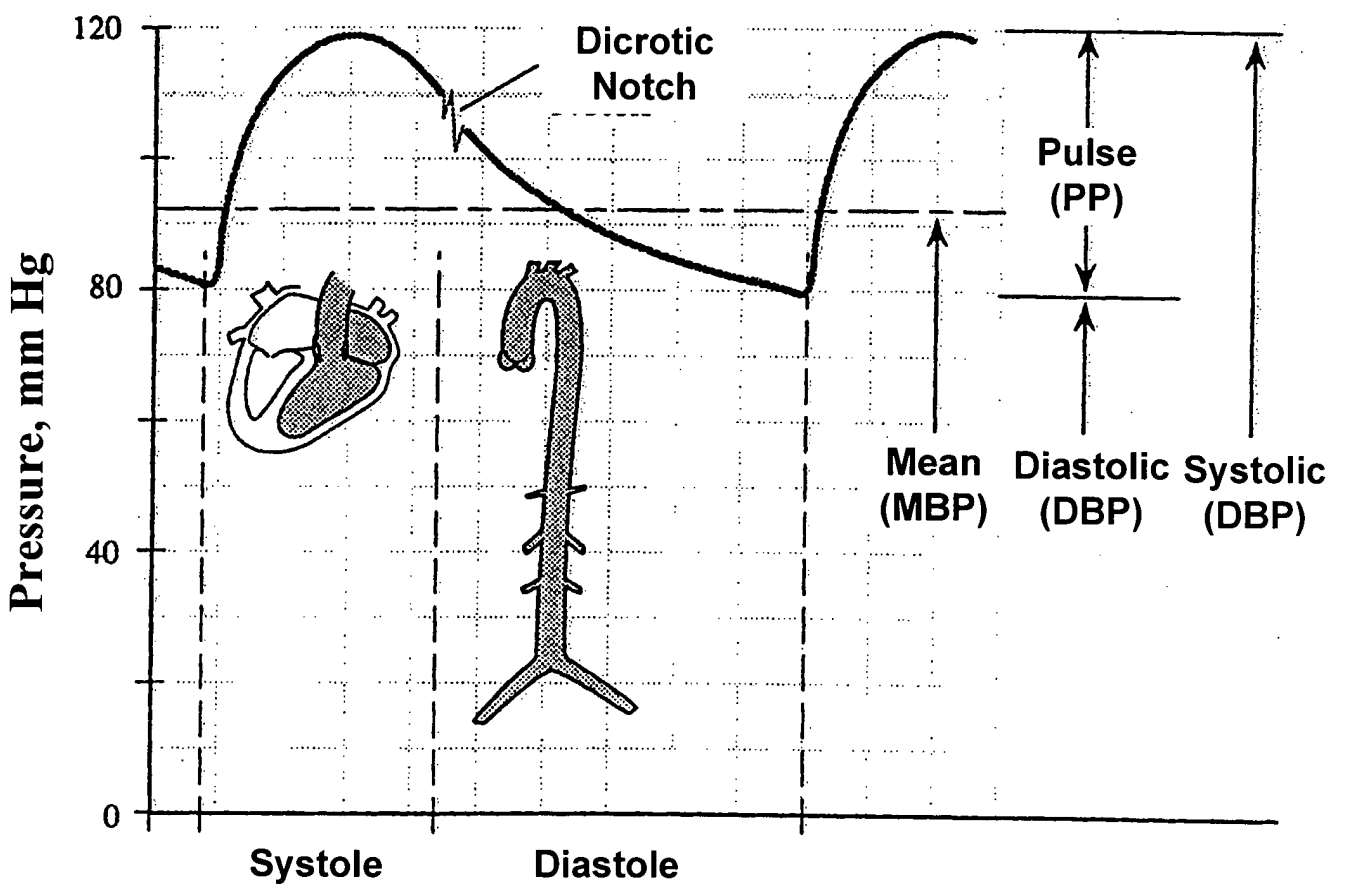


# Measurement of Arterial Blood Pressure



**FIG. 1**  
**PRIOR ART**

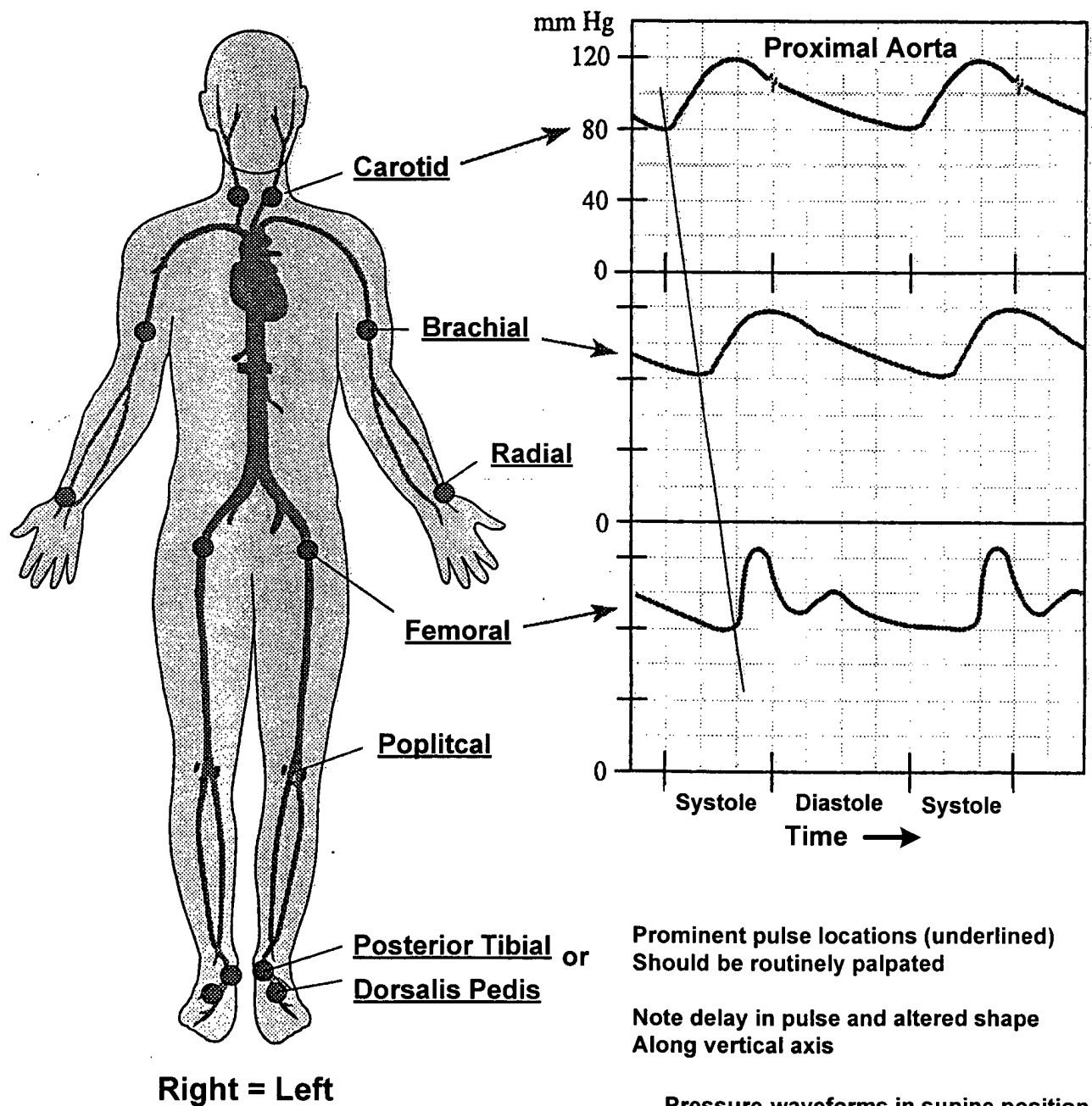
**Arterial Pulse/BP, (Proximal Aorta)**

**FIG. 2**  
**PRIOR ART**

## Peripheral Pulses

Pulse Rate = pulses/60 sec

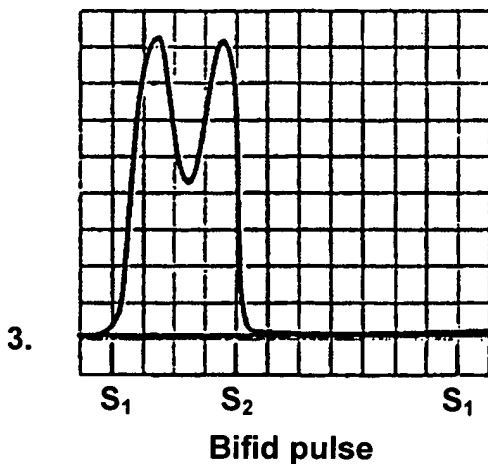
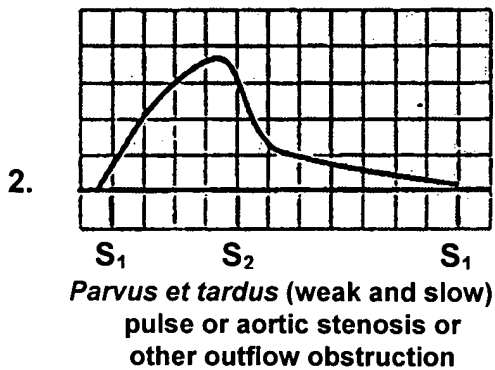
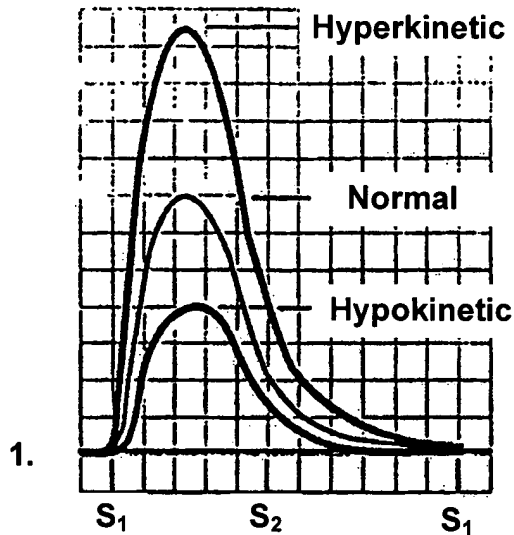
Normal: 72 +8 Tachycardia  
-14 Bradycardia



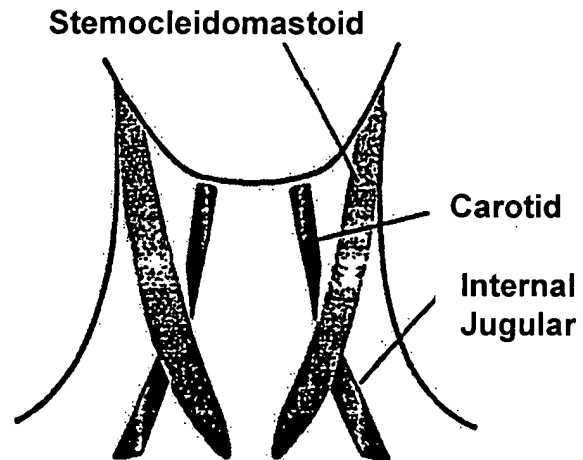
**FIG. 3**  
**PRIOR ART**

## Contour of Carotid Pulse and Cardiac Impulse

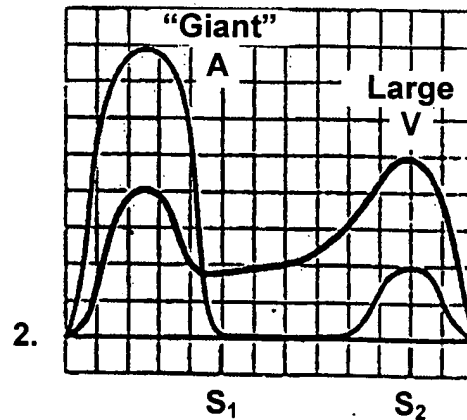
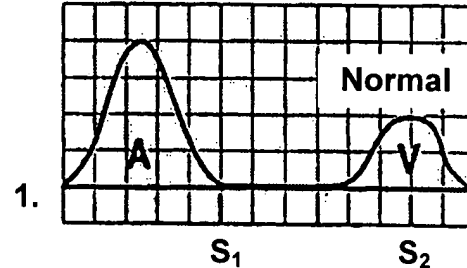
### A. Carotid Pulses



### B. Location of carotid and jugular pulses



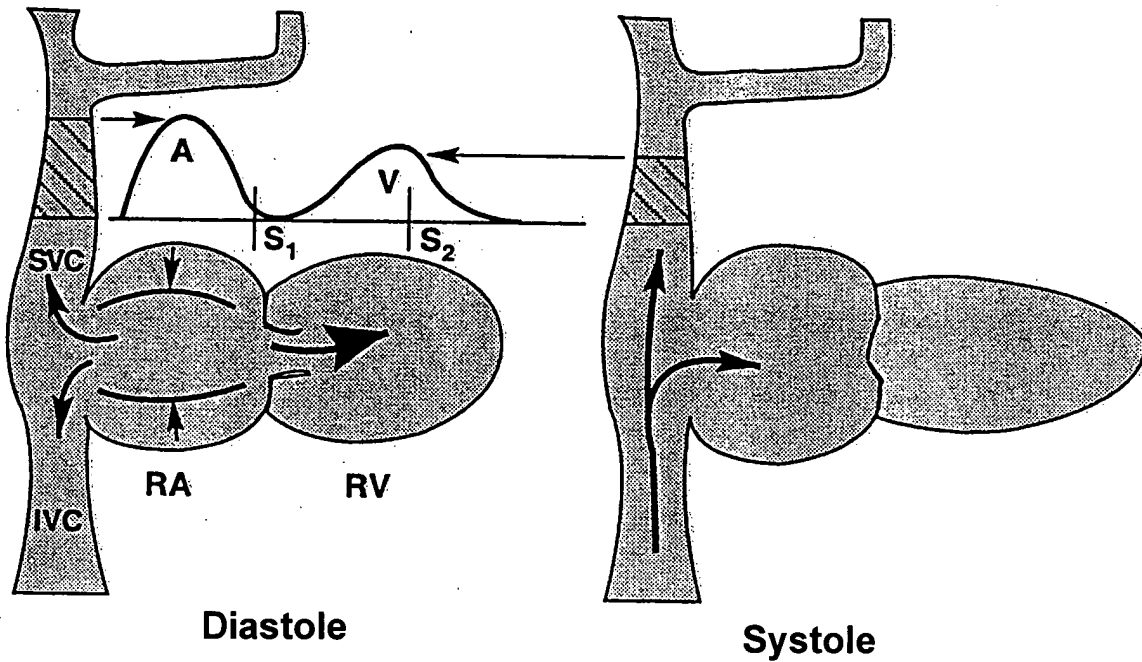
### C. Jugular Venous Pulses



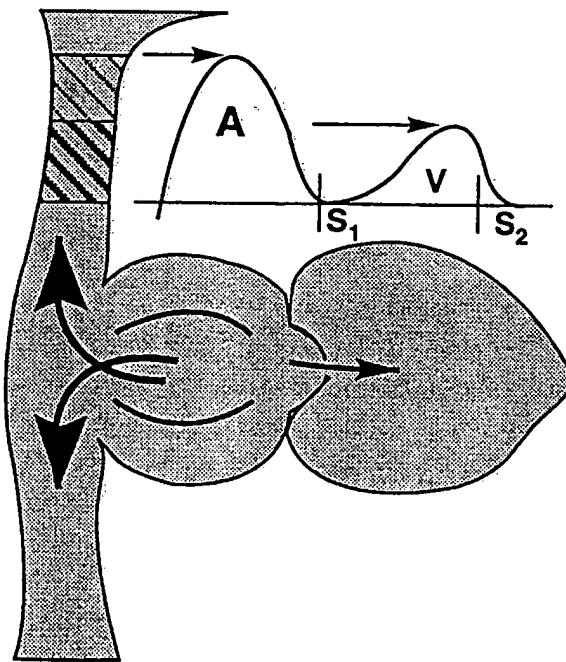
**FIG. 4**  
**PRIOR ART**

## Jugular Venous Pulses

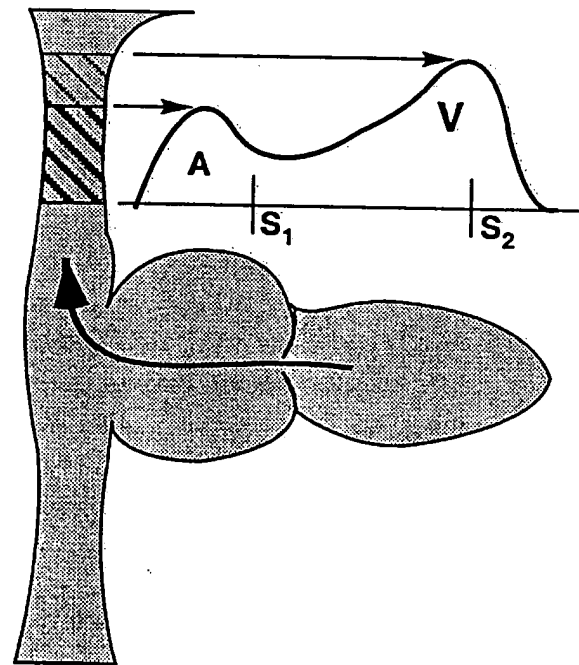
### A. Normal



### B. Giant 'A' Wave

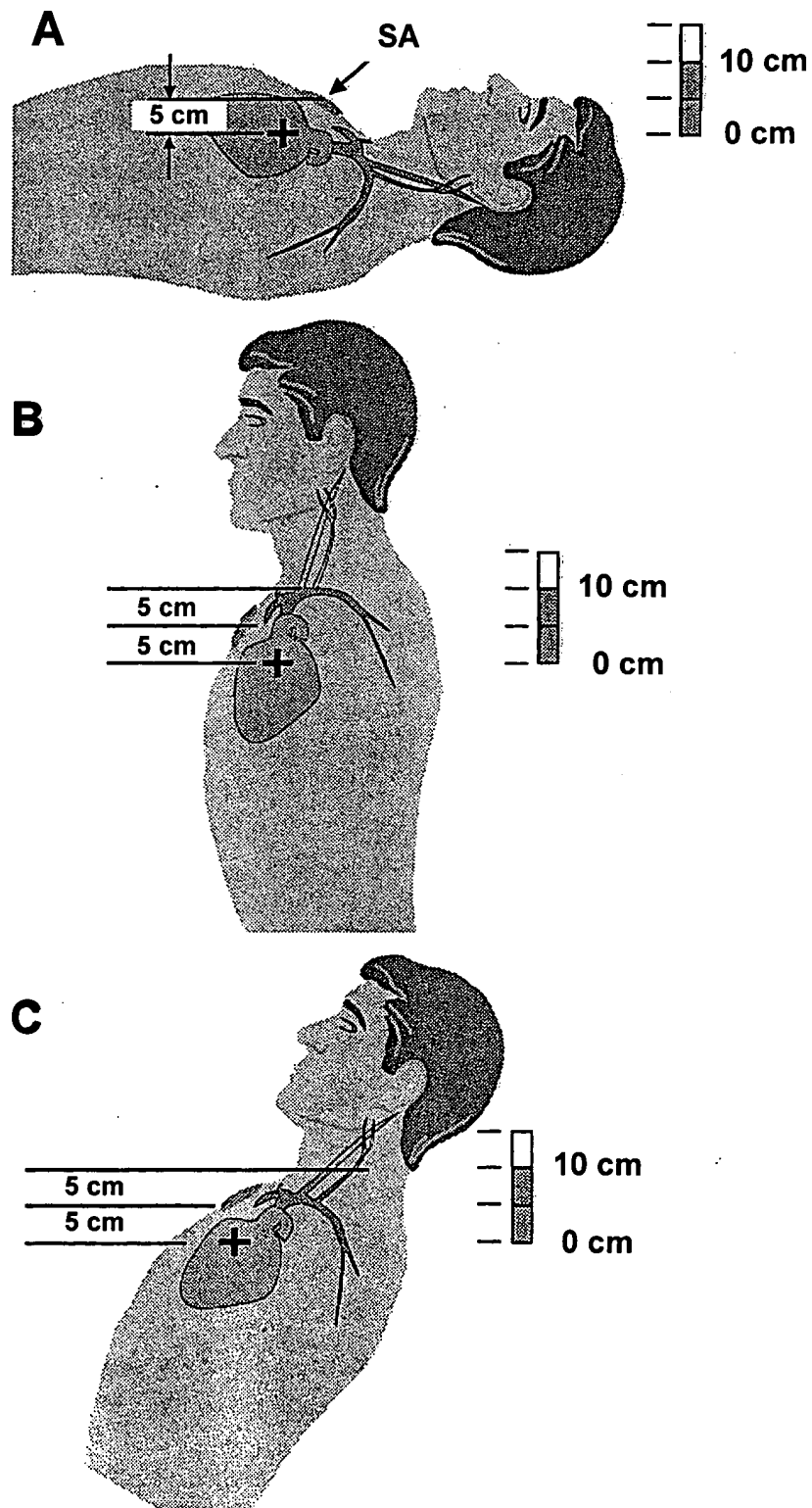


### C. Large 'V' Wave



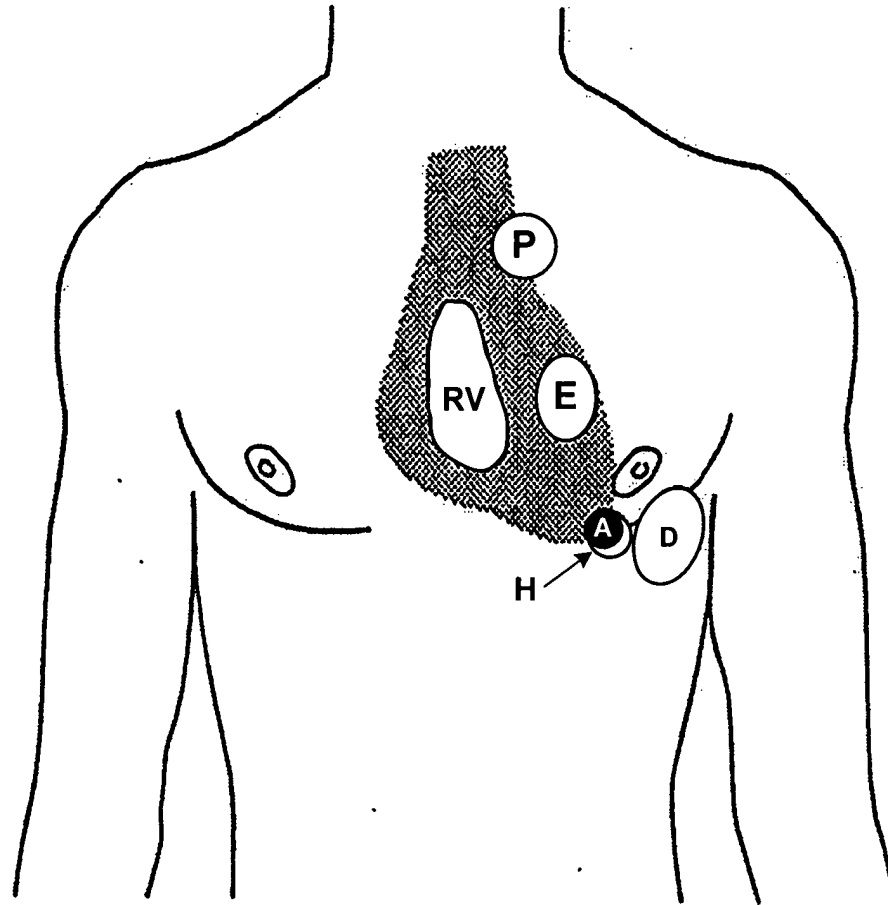
**FIG. 5**  
**PRIOR ART**

## Determination of Right Atrial Mean Pressure



**FIG. 6**  
**PRIOR ART**

## Principal Areas of Cardiac Impulses



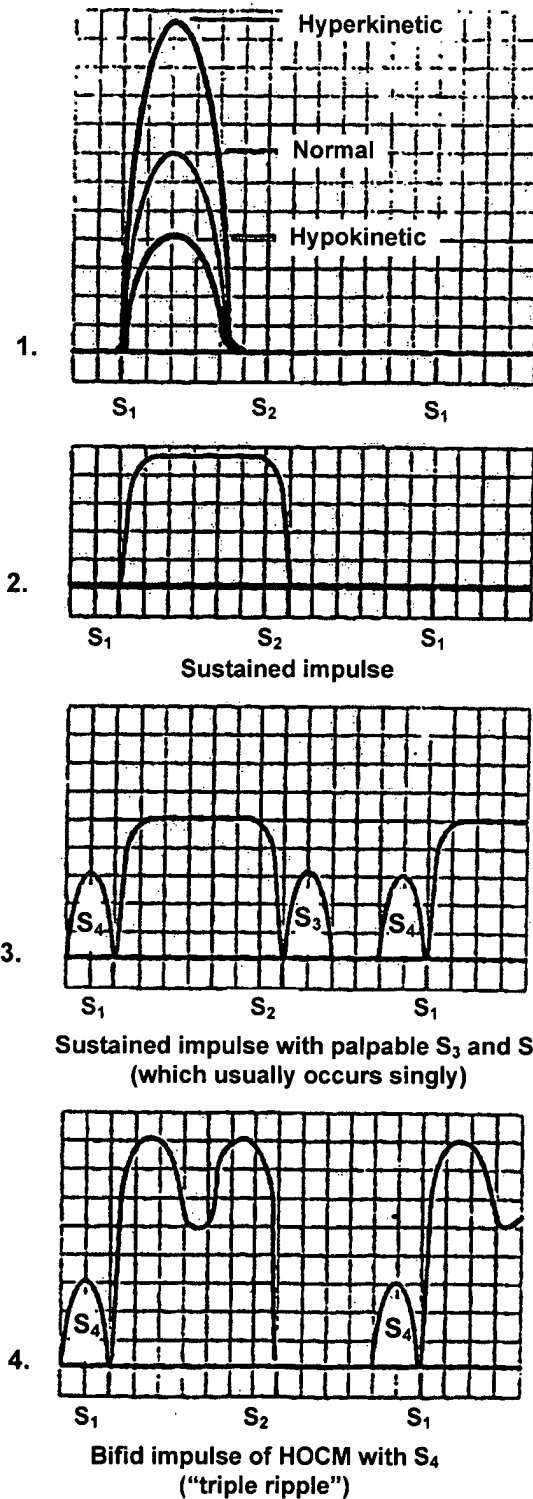
- A** Normal left ventricular apical area, "dime sized," 5LICS-MCL
- H** "Hypertrophied" left ventricular apical area, "quarter sized,"  
May be *slightly* shifted inferiorly or laterally
- D** "Dilated" left ventricular apical area, marked size increase, shifted laterally
- E** Ectopic area of left ventricle
- P** Pulmonic area, 2LICS, parasternal
- RV** Right ventricle area along lower left sternal border

Primary areas of precordial palpation: As you progress you will find that additional areas of abnormal pulsation may occasionally be found

**FIG. 7**  
**PRIOR ART**

# Contour of Precordial Ventricular Impulses

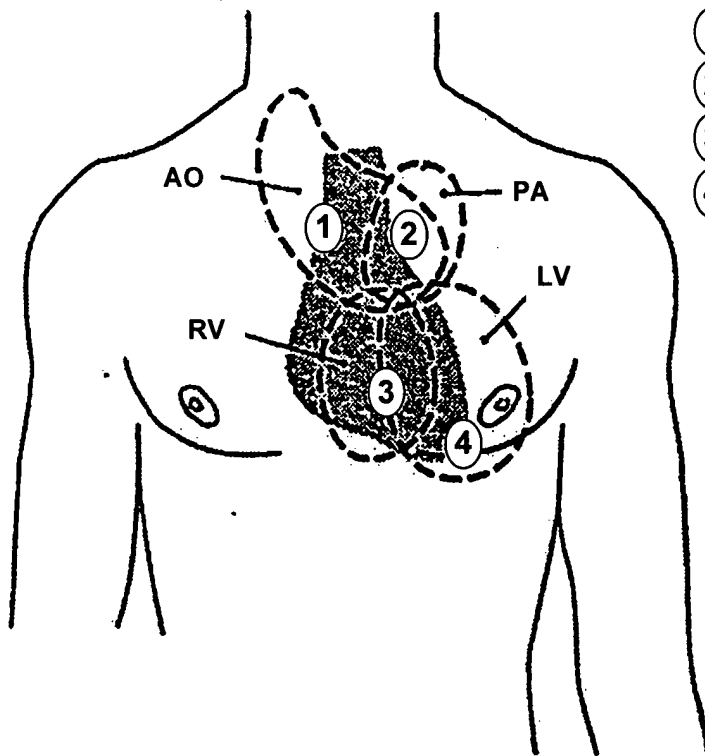
## Precordial Impulses



**FIG. 8**  
**PRIOR ART**



## Primary Areas for Cardiac Auscultation



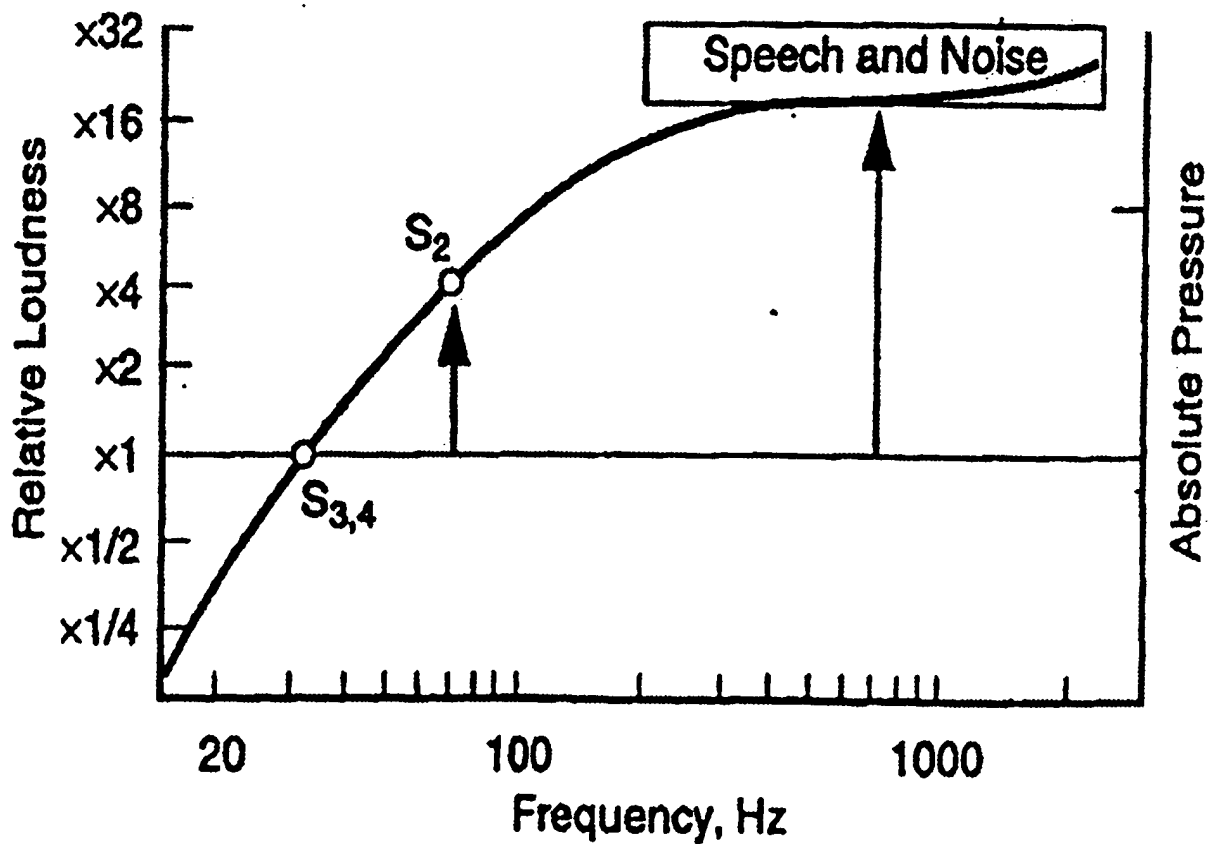
- ① Aortic Area (2RSB)
- ② Pulmonic Area (2LSB)
- ③ Tricuspid Area (4LSB)
- ④ Mitral, (Apical) Area (5LICS, MCL)

As you progress you will find that additional areas are necessary in cardiac auscultation.

Optimal locations for auscultations of the various anatomic regions are shown in numbered circles. Typical extent of the sounds from various areas are shown by dotted lines. This extent will vary with pathology and some sounds and murmurs may "radiate" to other areas such as the left axilla in mitral regurgitation. Sounds from the aorta, pulmonary artery and left artium may be heard well or even best over the posterior upper thorax as shown.

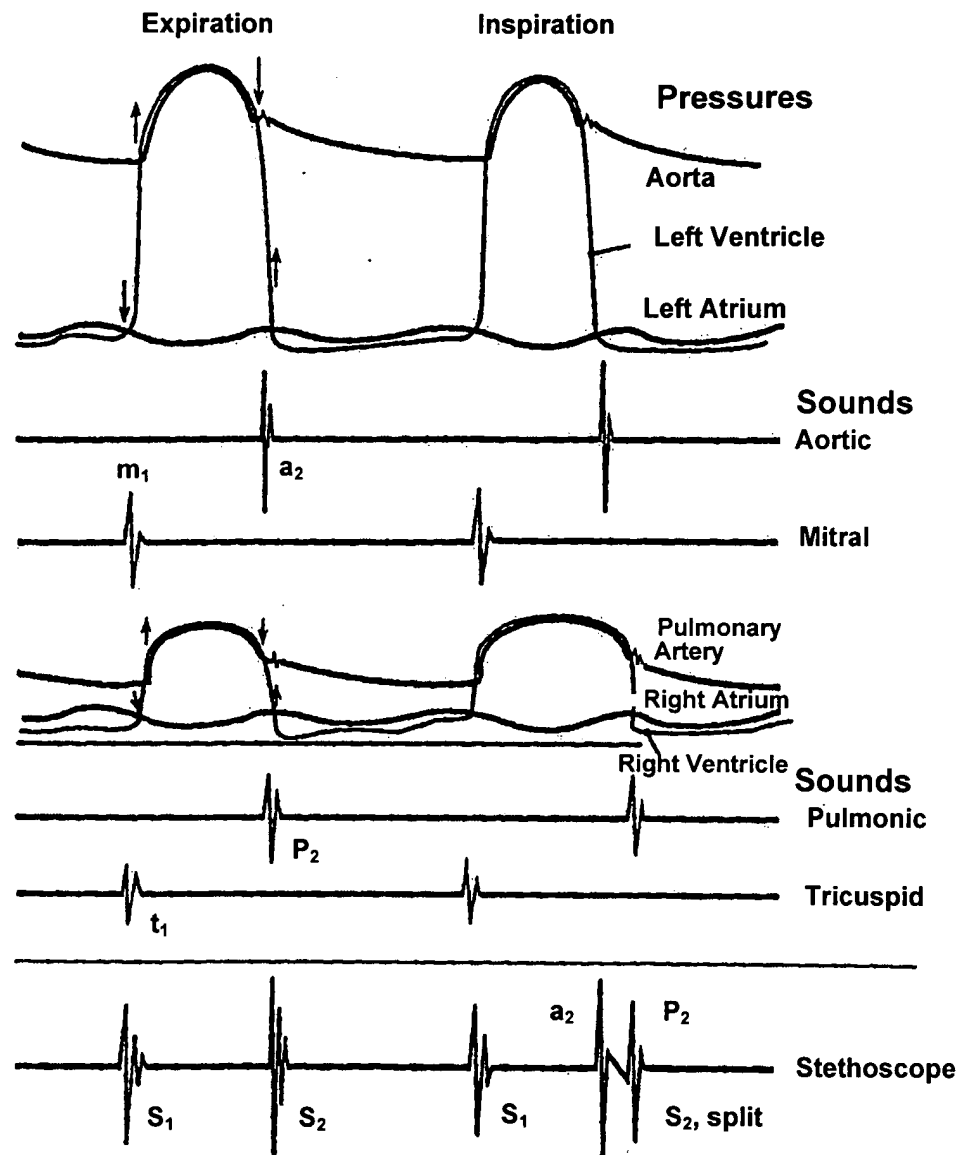
**FIG. 9**  
**PRIOR ART**

**Perceived Loudness of Heart Sounds and Quiet Speech  
at Same Sound Level (~50 dB SPL)**



**FIG. 10**  
**PRIOR ART**

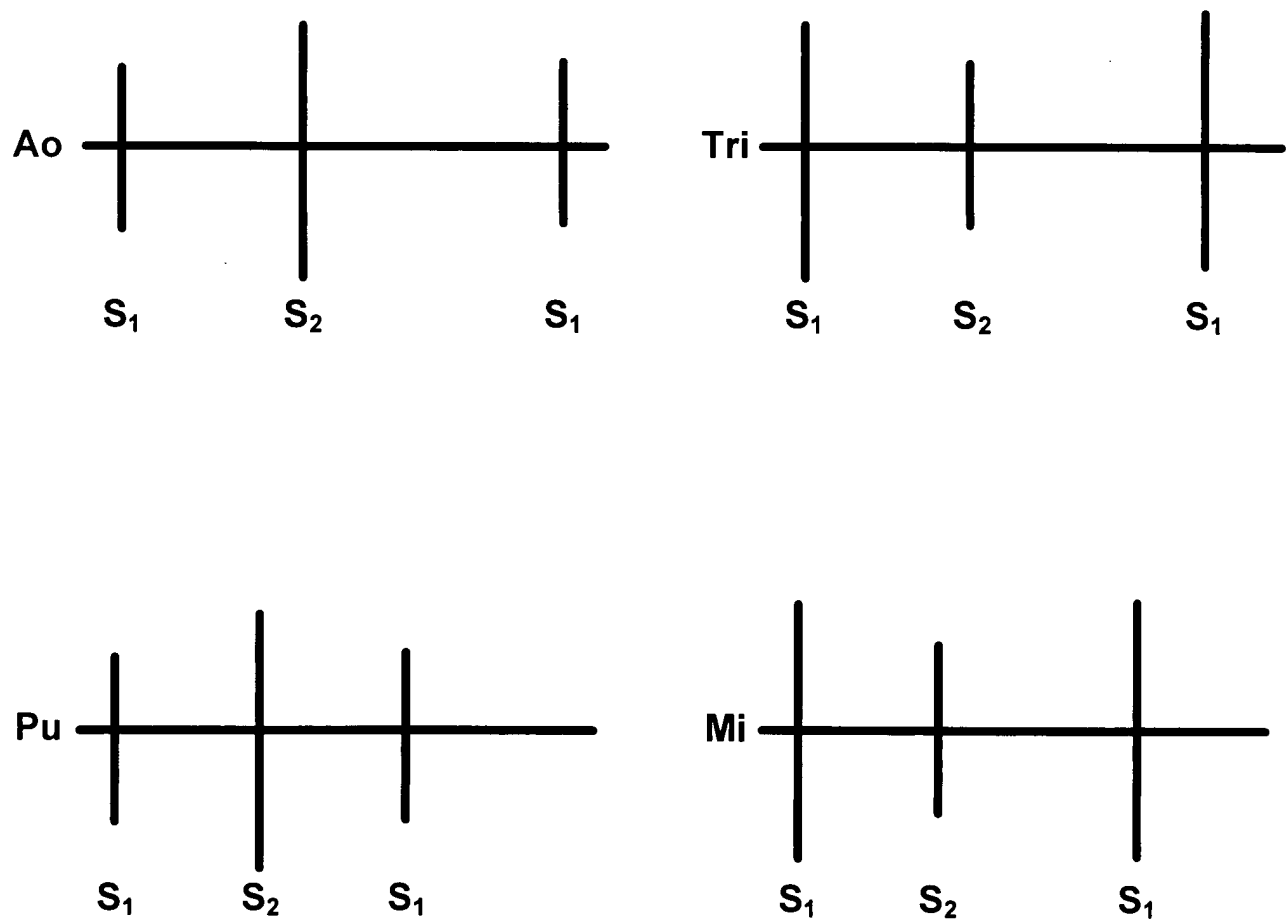
## Generation of Normal Heart Sounds, S<sub>1</sub>,



Normal valves open silently, indicated by ↑. Closing times, indicated by ↓, of mitral and tricuspid valves are typically so close that their individual sounds m<sub>1</sub> and t<sub>1</sub>, merge to form S<sub>1</sub>. On expiration the same is true for aortic and pulmonic valves and their sounds, a<sub>2</sub> and p<sub>2</sub>. With increased negative intrathoracic pressure on inspiration the right heart increases its volume and blood is retained in the lungs, reducing left heart volume. Consequently closure of the pulmonic valve is delayed by ejection of the larger volume while aortic valve closure occurs earlier than normal, thus "splitting" the usually merged second heart sounds. Respiratory splitting of the second heart sound occurs in some 30% of normal youth, but its prevalence is reduced by age until it is normally absent by age 60.

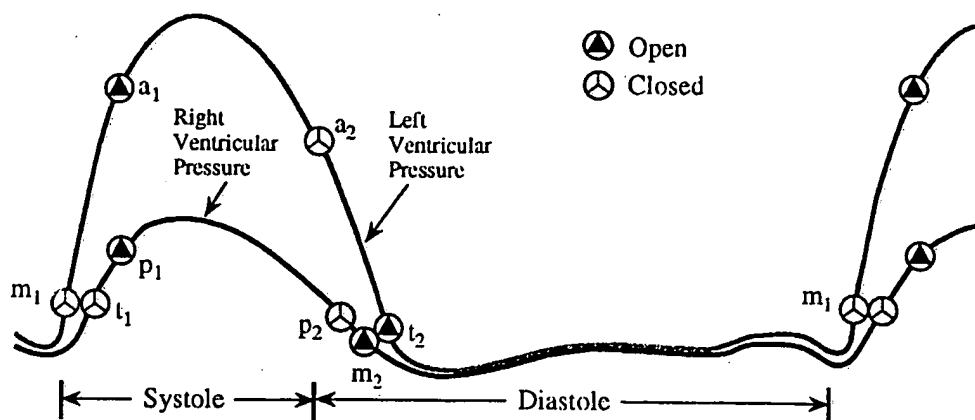
**FIG. 11**  
**PRIOR ART**

## Normal Heart Sounds vs. Auscultatory Areas, Typical

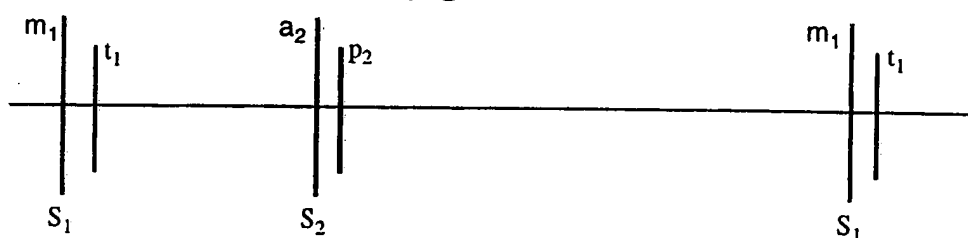


**FIG. 12**  
**PRIOR ART**

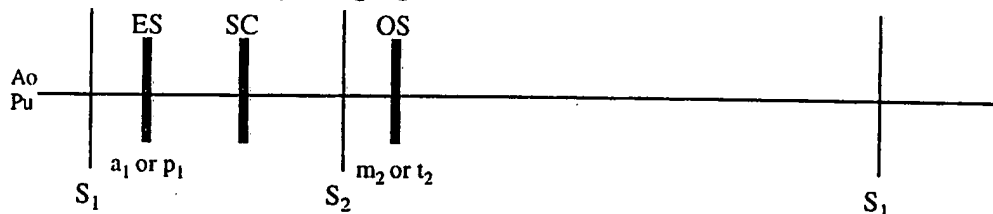
# Basic Heart Sounds



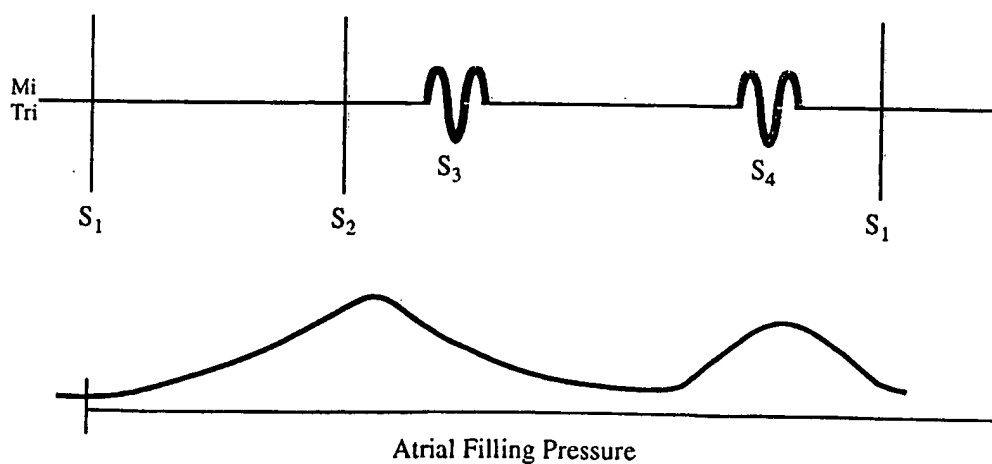
## 1. $S_{1,2}$ Valve closure and splitting



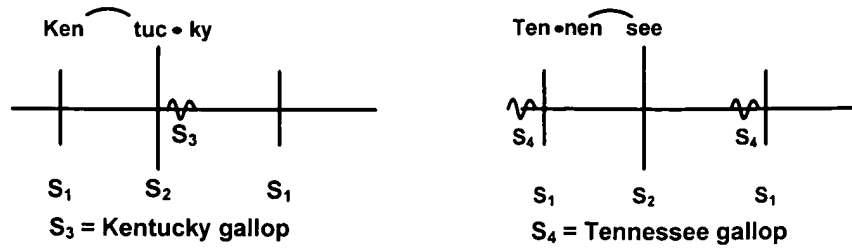
## 2. Abnormal Valve Opening



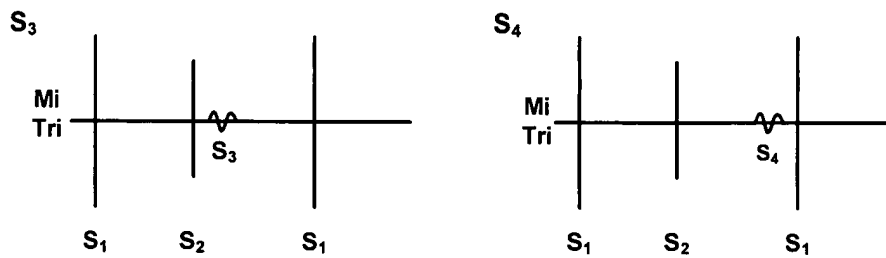
## 3. $S_{3,4}$ Ventricular Filling



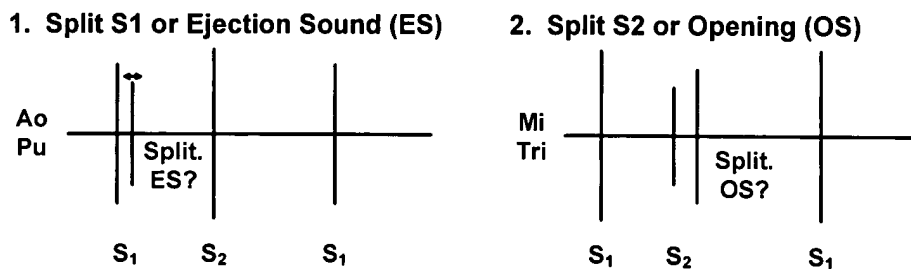
**FIG. 13 - PRIOR ART**



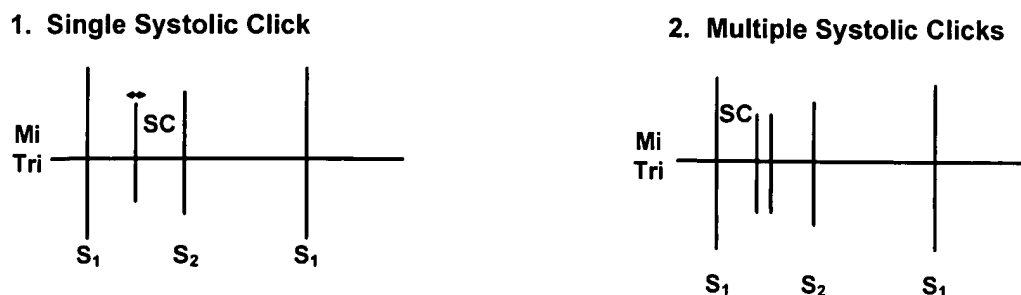
**FIG. 14**  
**PRIOR ART**



**FIG. 15**  
**PRIOR ART**



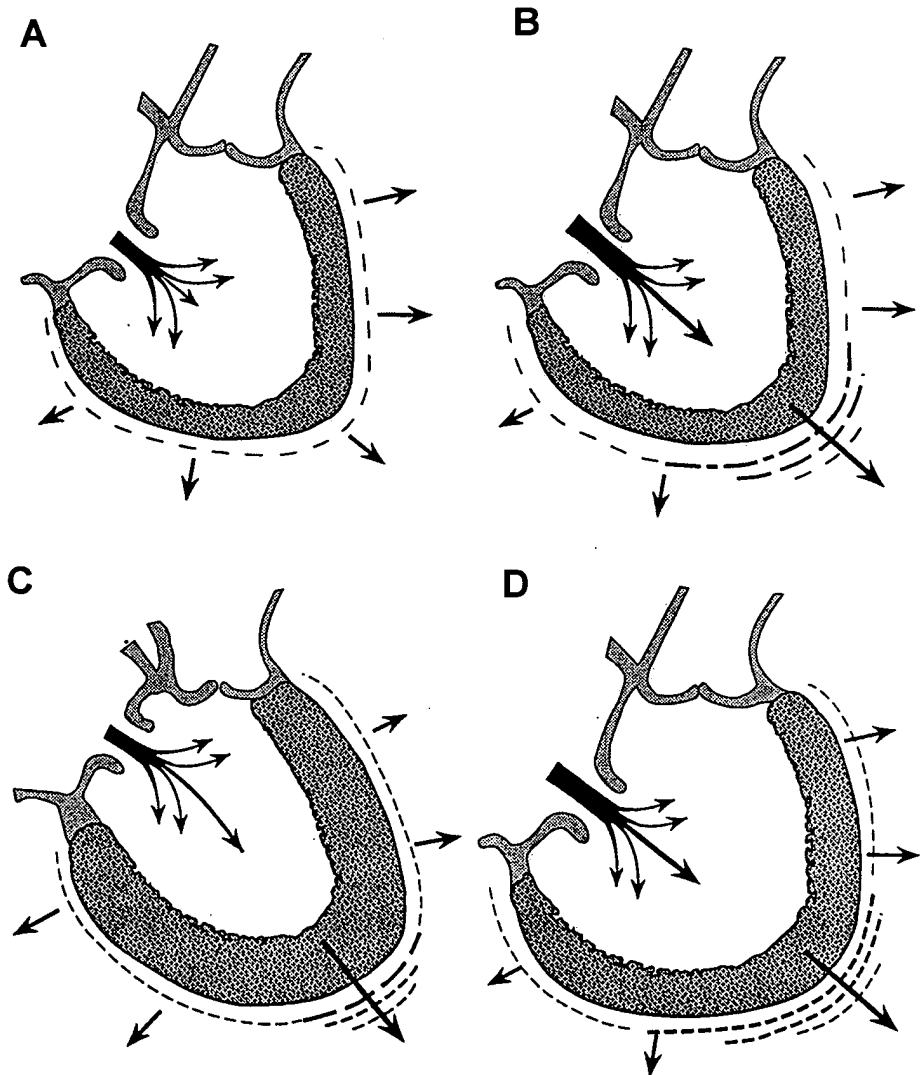
**FIG. 16**  
**PRIOR ART**



**FIG. 17**  
**PRIOR ART**

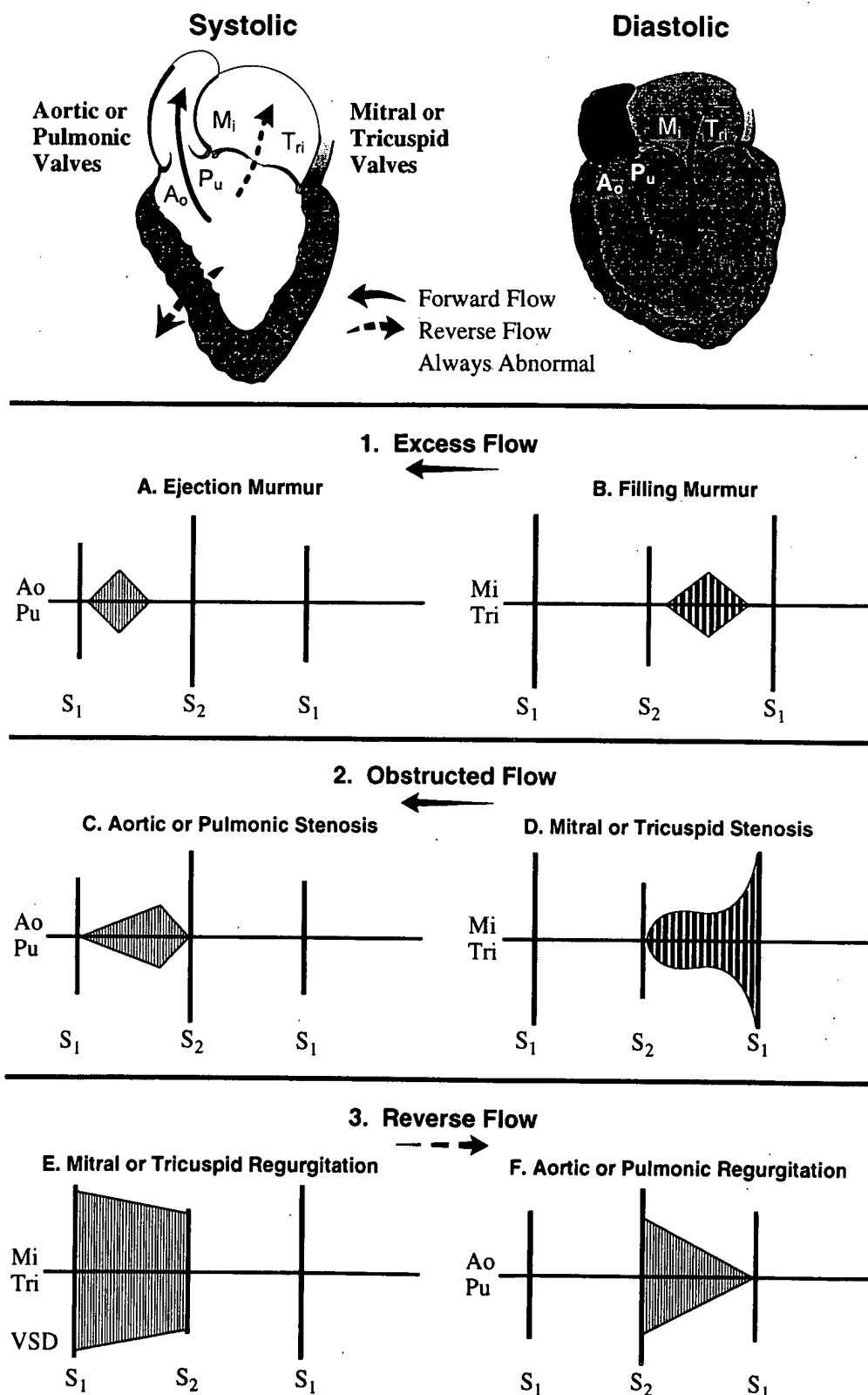
## Generation of S<sub>3</sub> and S<sub>4</sub>

- A** Normal filling of ventricles does not cause displacement and diastole is silent
- B** Excess velocity of blood early in filling may "shove" the ventricle longitudinally causing oscillation (dotted lines) and an S<sub>3</sub>, in some normals. Excess blood flow may cause a *physiologic* S<sub>3</sub>.
- C** A stiff ventricle may be longitudinally displaced by normal filling. This usually produces an S<sub>4</sub> but an S<sub>3</sub> may be present.
- D** A volume overloaded ventricle may be displaced and usually produces an S<sub>3</sub> but may produce an S<sub>4</sub>.



**FIG. 18**  
**PRIOR ART**

# Basic Cardiac Murmurs (Right or Left Ventricular)



**FIG. 19 - Prior Art**



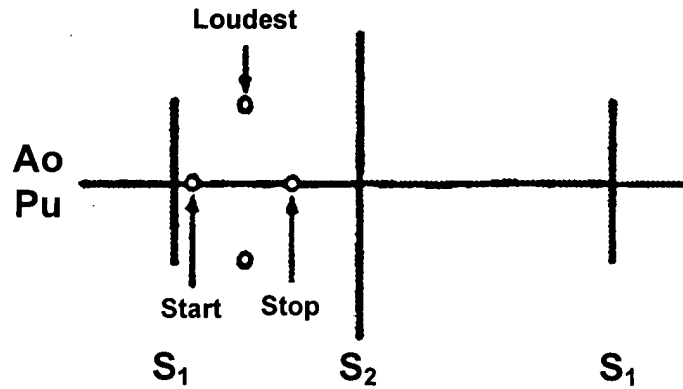
## Diagrammatic and Descriptive Features of Heart Sounds/Murmurs

Diagram	Description	Diagram	Description
<b>Timing: Interval</b> 		<b>Shape: (Independent of duration)</b> 	
	Systolic		Crescendo (rising)
	Diastolic		Decrescendo
<b>Location in Interval</b> 	Early		Crescendo, Decrescendo, "Diamond Shaped Triangular"
	Mid		<b>Grade:</b> 1 - barely audible 2 - audible 3 - moderately loud 4 - loud 5 - very loud 6 - heard without stethoscope, may be palpable
	Late		
<b>Duration</b> 	Short ("brief")		
	Long		
	Pan or Holo (entire interval)	<b>Pitch: (frequency)</b> 	High
			Low
		<b>Quality:</b> NA	"Blowing," "soft," "quiet," "cooing," "machinery," "rumble," etc.
<b>Note: "Pre-" and "Post" are closely associated with another event; e.g., pre systolic</b>		<b>Location, variation with respiration:</b> NA	Describe where Loudest, radiation

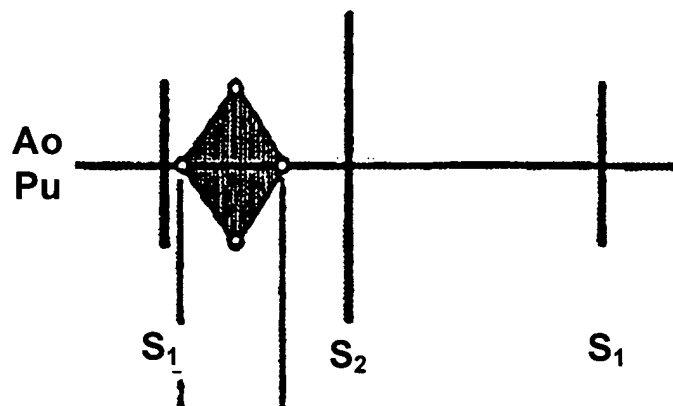
**FIG. 20 PRIOR ART**

# Ejection Murmurs

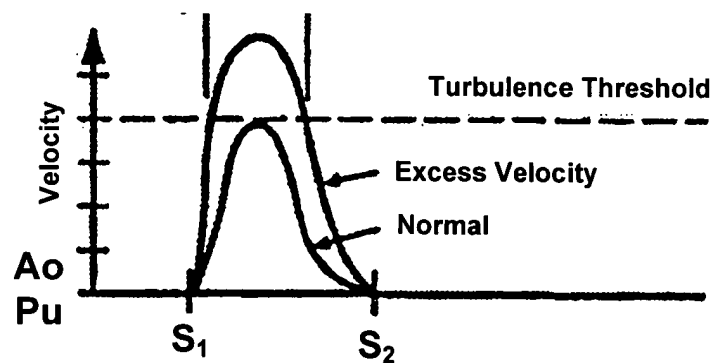
## A. Critical Points



## B. Profile



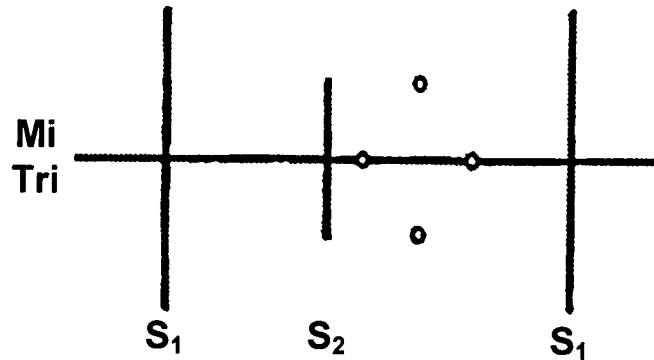
## C. Velocity Profile



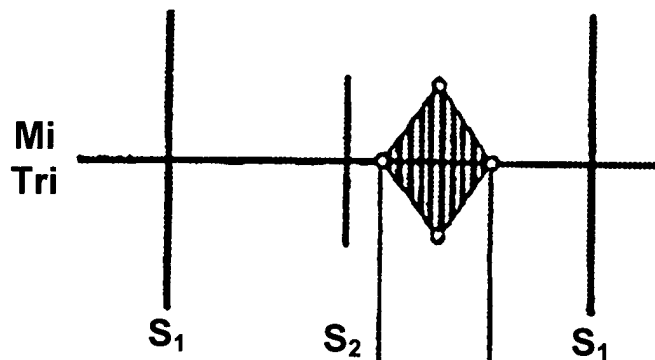
**FIG. 21**  
**PRIOR ART**

## Filling Murmurs

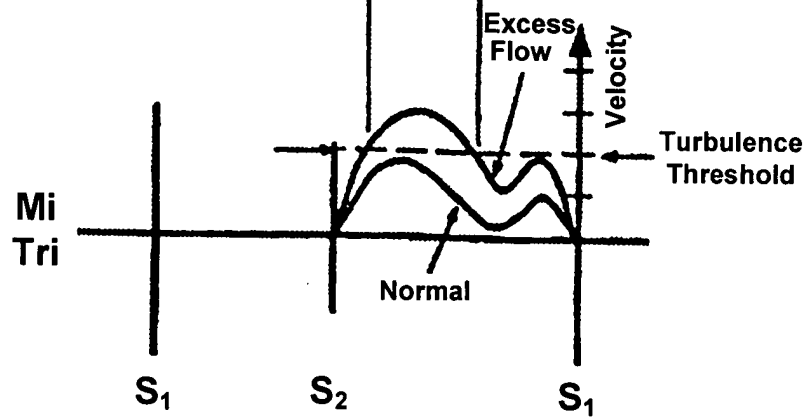
### A. Critical Points



### B. Sound Profile

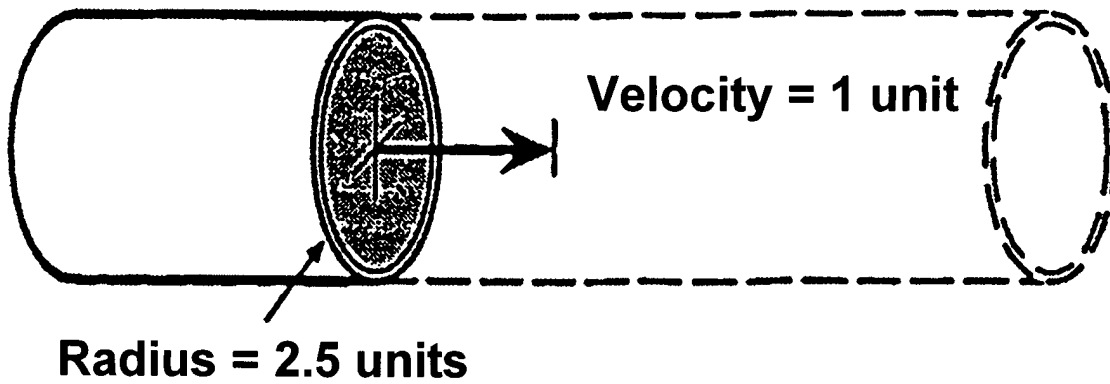


### C. Velocity Profile

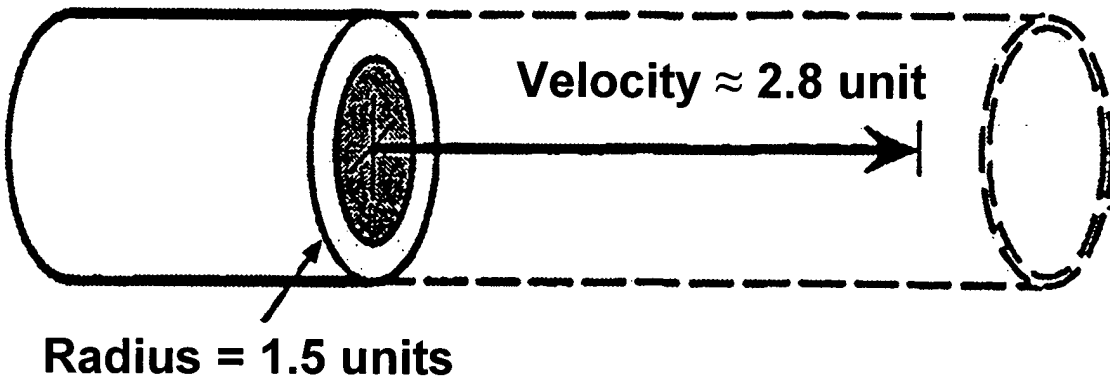


**FIG. 22**  
**PRIOR ART**

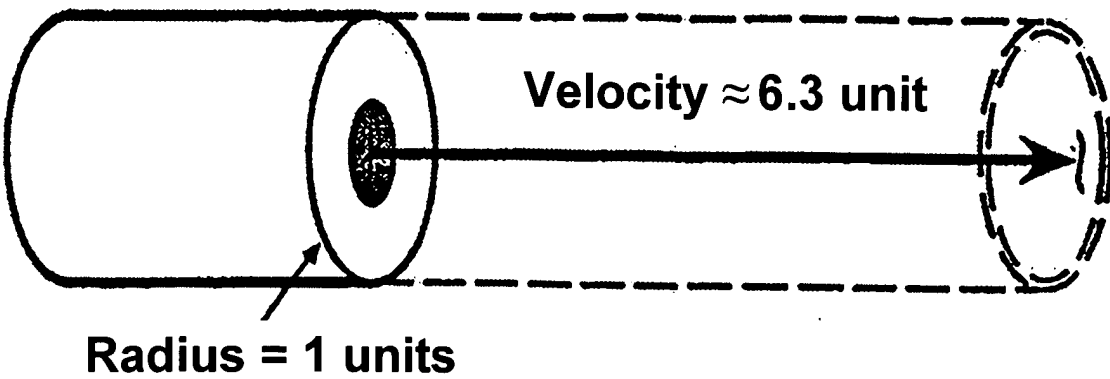
A.



B.



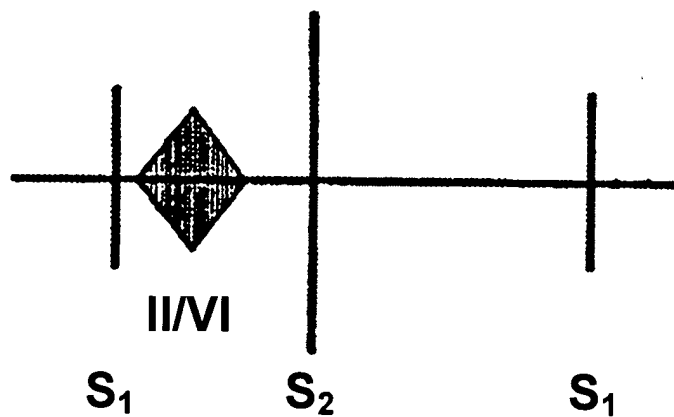
C.



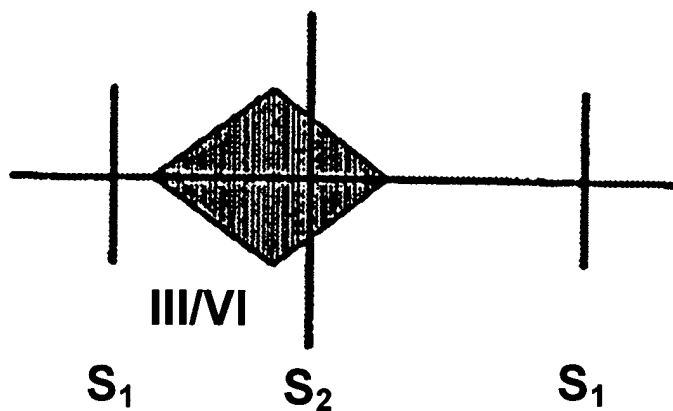
**FIG. 23**  
**PRIOR ART**

## Peripheral Murmurs – *Bruits, Soufflés, etc.*

### A. Right Carotid



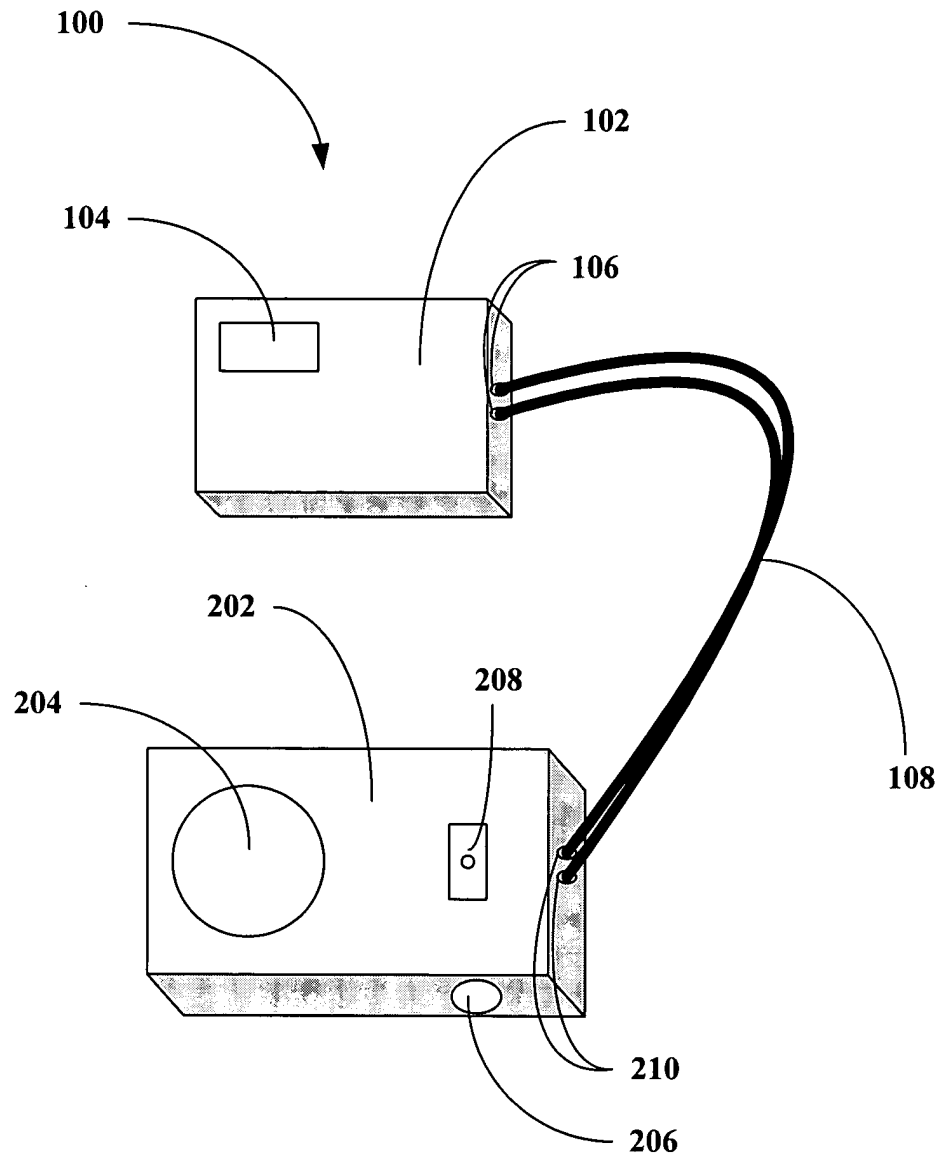
### B. Left Carotid

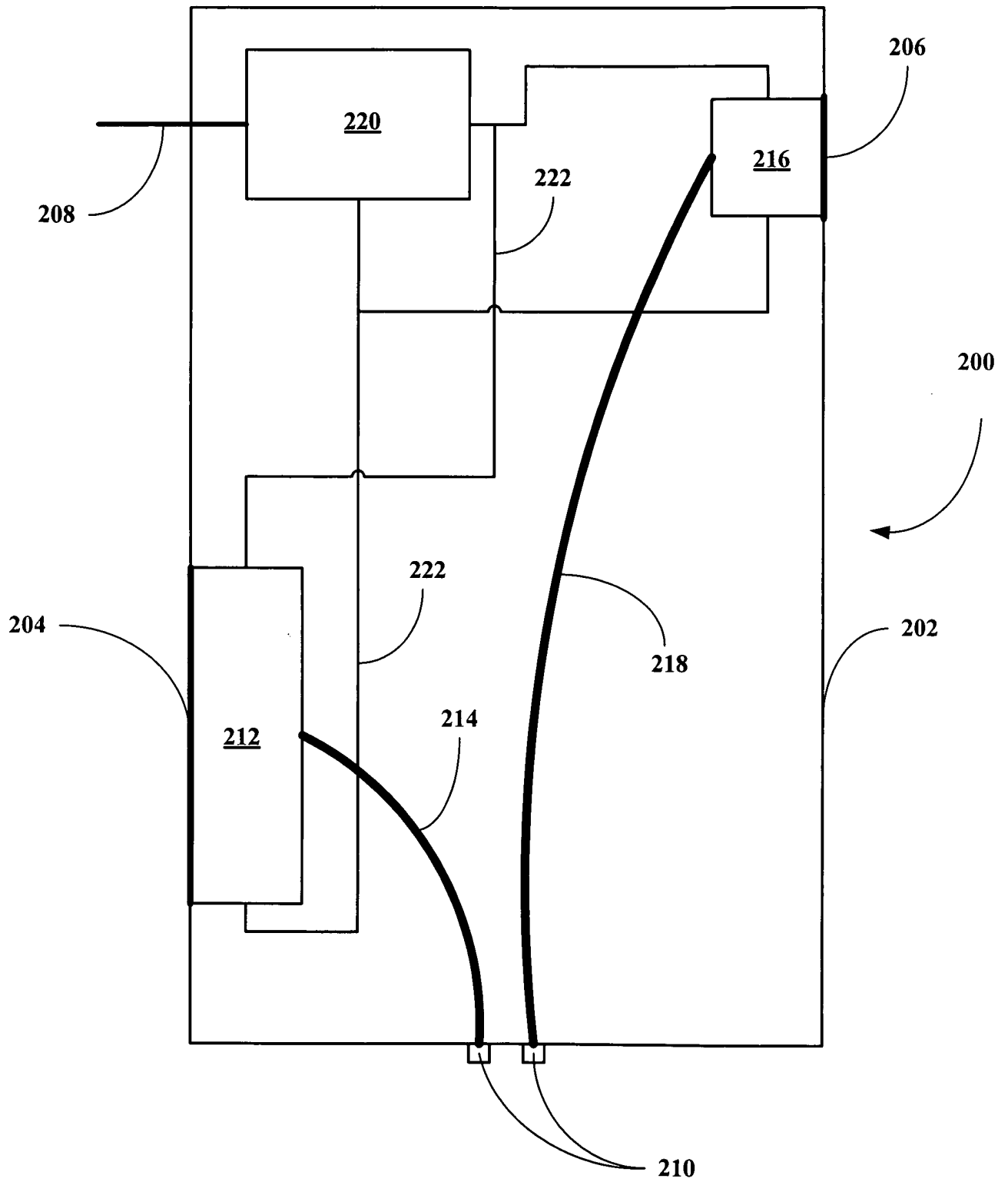


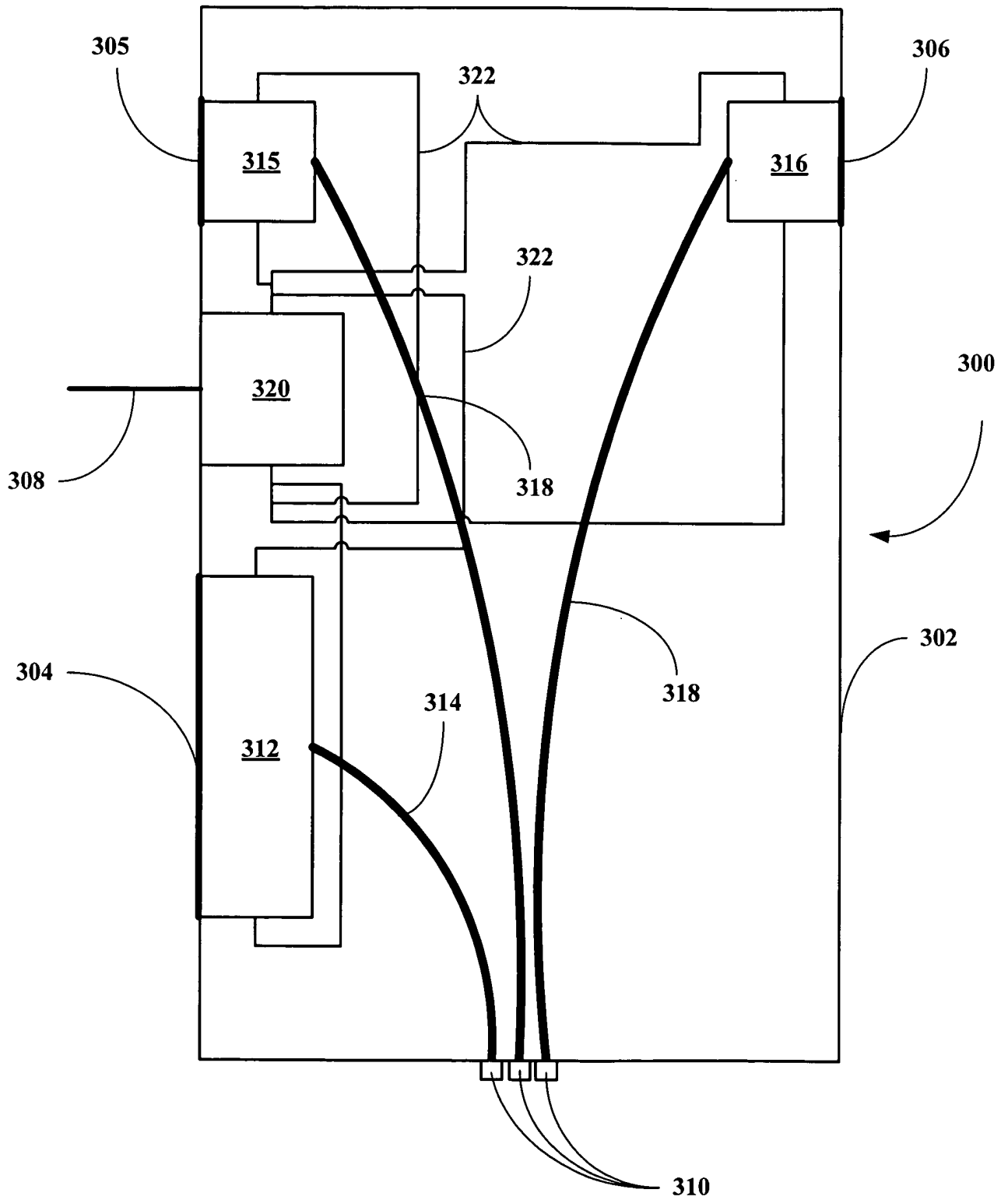
### C. Abdomen



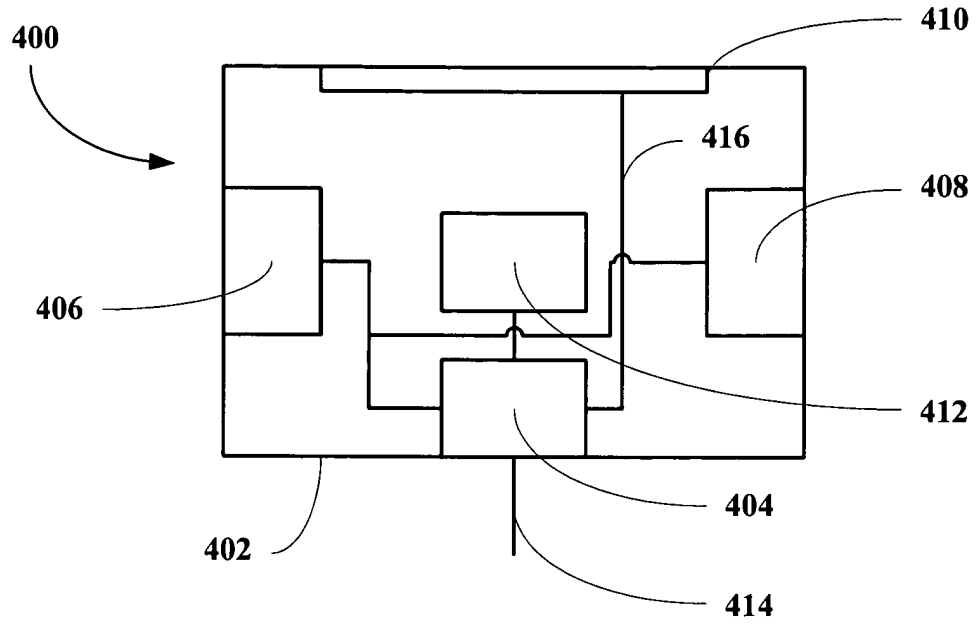
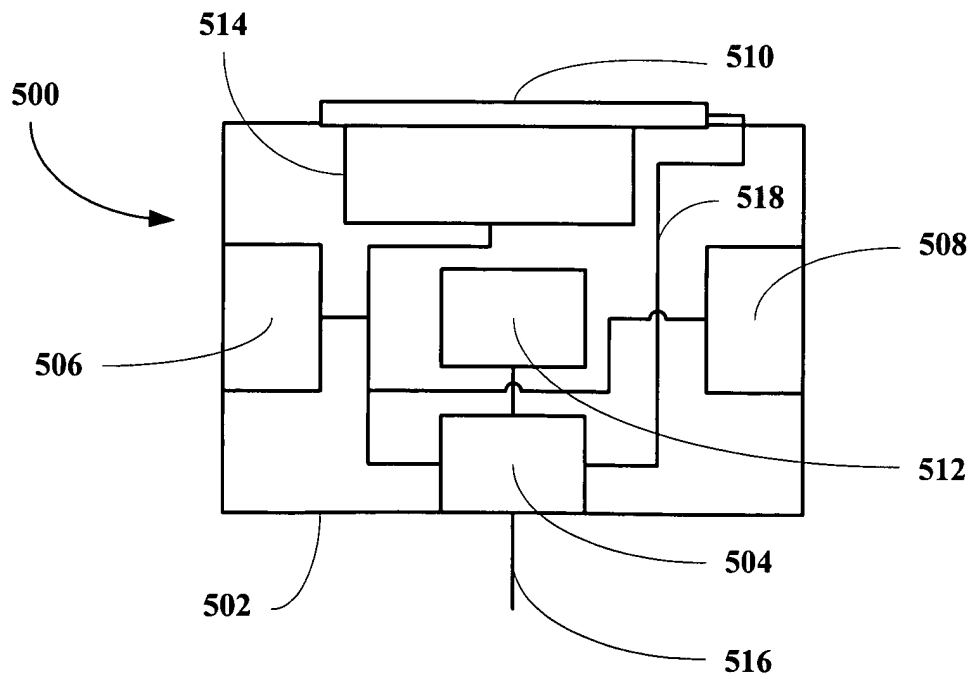
**FIG. 24**  
**PRIOR ART**

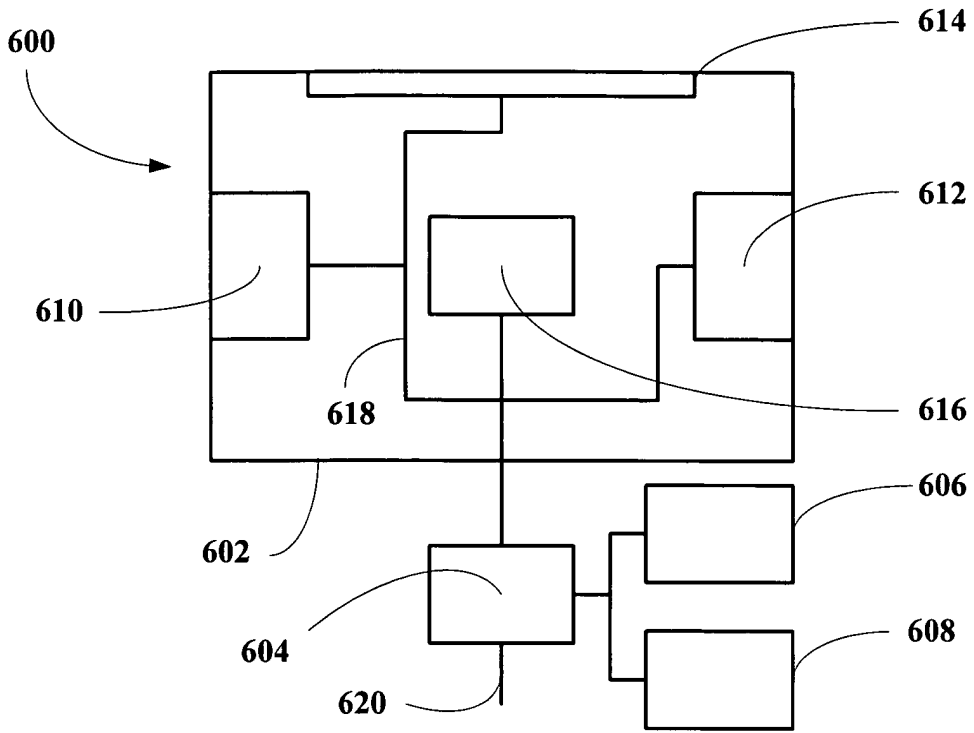
**FIG. 25**

**FIG. 26**

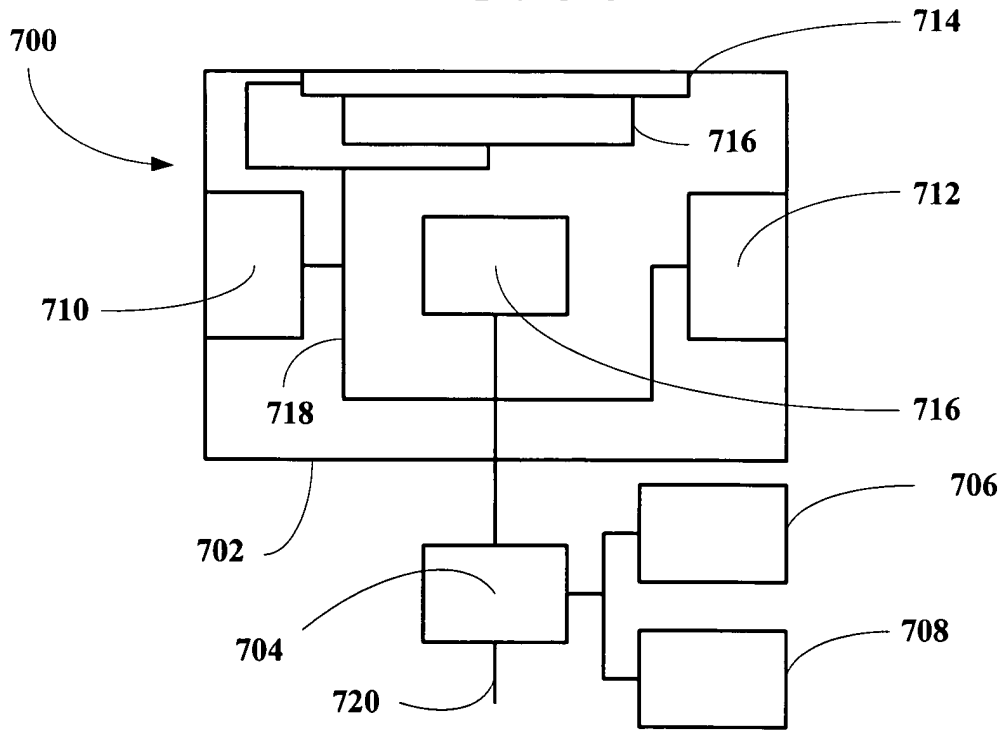
**FIG. 27**



**FIG. 28****FIG. 29**



**FIG. 30**



**FIG. 31**